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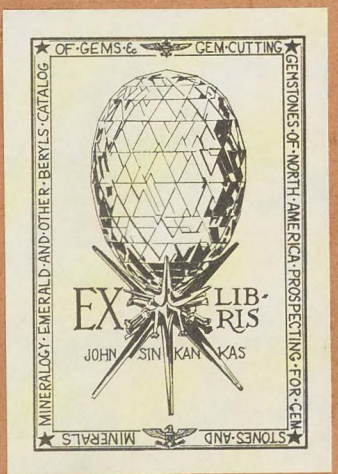
(*From "RECORDS of the AUSTRALIAN MUSEUM,"* Vol. vii., No. 4, *1909.*)

Topaz

MINERALOGICAL NOTES: No. VIII.—TOPAZ, ANGLESITE, AND OTHER AUSTRALIAN MINERALS.

By C. ANDERSON, M.A., D.Sc (Edin.),
Mineralogist.



SYDNEY, 30th AUGUST, 1909

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(Plates lxxix.-lxxxi.)

TOPAZ.

Carpet Snake Creek, near Torrington, N. S. Wales.

(Plate lxxix., figs. 1, 2.)

The specimens here described consist of a small lot of isolated crystals and a fragment of matrix carrying one magnificent crystal and several smaller ones; they were acquired by the Trustees from Mr. Charles Bogenrieder, Mining Engineer. The figured crystal, which measures ·8 × 1·5 × 3·25 cm., is loosely attached to a matrix consisting of a clayey decomposition product (evidently felspathic), quartz, wolfram, molybdenite, and a small quantity of a purplish mineral too minute for determination, but which is in all probability fluorspar. The topaz is closely moulded on the accompanying minerals, which therefore preceded it in most cases. No information is available regarding the geological conditions of its occurrence, but the hand specimen indicates a decomposed pegmatite vein as its original home.

The crystals are colourless, transparent, and of a uniform habit, belonging to the Russian domatic type; the crystallographic characters are very similar to those of the Emmaville topaz.[1] The faces, with the exception of the base which is always more or less rough, are highly polished and give good signals. Prism forms are numerous, *m* (110) being the best developed; *l* (120) has fairly large faces, but other forms in this zone are very narrow. Of the domes, *f* (021) and *d* (201) are prominent, *y* (041) and *h* (203) small; *o* (221) and *u* (111) are the most important pyramids. An interestiug feature is the presence on the *m* faces of very distinct, quadrangular markings, resembling the

[1] Anderson—Austr. Mus. Rec., v., 1904, pp. 296-299; *Ib.*, vi., 1905, pp. 83-85.

"wachtums-figuren" described by Goldschmidt on the topaz from the Thomas Range, Utah.[2] The prism faces in general show a slight vertical striation. The dome *d* is striated somewhat irregularly in a direction parallel to its intersection with *o*; this is not due to oscillatory combination, but to etching, and, now and then, indications are seen of a definite etch-figure shaped somewhat like a pear with the blunt end directed upwards. The faces of *y* and *f* inter-oscillate.

Five crystals were measured on the two-circle goniometer; the mean angles obtained are tabulated below, together with the calculated values given by Goldschmidt[3] (Dana's axes and lettering are adopted).

Forms.		Measured.				Calculated.				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
c	001	—		—		—		—		—	—
b	010	0	6	90	0	0	0	90	0	6	0
N?	210	75	0	—		75	12	,,		12	0
m	110	62	$7\frac{1}{3}$	90	0	62	8	,,		$\frac{2}{3}$	—
O?	560	57	38	89	58	57	37	,,		1	2
M	230	51	42	89	58	51	35	,,		7	2
r?	7·13·0	46	1	—		45	32	,,		29	—
l	120	43	25	90	0	43	25	,,		0	0
u?	5·11·0	40	32	—		40	42	,,		10	—
π	250	37	4	90	2	37	7	,,		3	2
g	130	32	18	89	59	32	14	,,		4	1
n	140	25	19	89	59	25	19	,,		0	1
f	021	0	0	43	38	0	0	43	39	0	1
y	041	0	2	62	24	,,		62	20	2	4
h	203	90	1	31	16	90	0	31	2	1	14
d	201	90	0	61	1	,,		61	0	0	1
i	223	62	6	34	16	62	8	34	14	2	2
u	111	62	9	45	36	,,		45	35	1	1
o	221	62	$7\frac{1}{2}$	63	55	,,		63	54	$\frac{1}{2}$	1
x	243	43	20	41	10	43	25	41	12	5	2

Of the doubtful faces *N* and r were observed twice (images not good), *O* and u once each (images fairly good).

[2]Goldschmidt—Zeits. Kryst., xl., 1905, pp. 379, 382, pl. x., fig. 6b.

[3]Goldschmidt—Krystallographische Winkeltabellen, 1897, pp. 346-348.

The observed combinations are shown in the following table (ii. is the figured crystal).

Cryst.	*c b N m O M* r *l* u *π g n f y h d i u o x*
i.	*c b* — *m* — *M* — *l* — *π g n f y h d i u o x*
ii.	*c b* — *m O M* — *l* — *π g n f y h d i u o x*
iii.	*c b N m* — *M* — *l* — *π g n f y* — *d* — *u o x*
iv.	*c b* — *m* — *M* — *l* — *π g n f y h d i u o* —
v.	*c b N m O M* r *l* u *π g* — *f y h d i u o x*

From the means of a large number of excellent measurements yielded by the forms *m* and *o* the following axial ratio was calculated :—$a : b : c = \cdot 52894 : 1 : \cdot 47754$.

GYPSUM.

Mount Elliott Mine, Chillagoe District, Queensland.

(Plate lxxix., fig. 3.)

At this mine very fine examples of crystallised selenite are found in association with native copper; I am told that prismatic crystals ten feet in length have been obtained. The crystal figured measures $2 \times 1 \cdot 5 \times 20$ cm.; it is terminated by the fibrous fracture parallel to *t* $(\bar{1}01)$ and twinned on *a* (100). The forms were determined by measurement with a contact goniometer, the approximate angles obtained being :—

b (010) $\wedge$ δ (350) = 41° ; calc. 41° 22′.
b (010) $\wedge$ *m* (110) = 55° ; calc. 55° 44′.

ANGLESITE.

Proprietary Mine, Broken Hill, N. S. Wales.

(Plate lxxx., fig. 1.)

Some brilliant colourless crystals of about 3 mm. diameter, associated with crystallised iodyrite and marshite, were observed on a limonitous matrix from this mine. Two crystals were measured and found to be anglesite of a type quite different from previously described Broken Hill anglesite.[4] The most prominent faces belong to *a* (100), *o* (011), *y* (122) ; *m* (110) and *a* inter-

[4] Toborffy—Ann. Mus. Nat. Hung., v., 1907, pp. 494-496, pl. xi., figs. 1-6; *Id.*—Zeits. Kryst., xliv., 1908, pp. 601-603, pl. xi., figs. 1-6; Anderson—Austr. Mus. Rec., vii., 1908, pp. 63-65, pl. xiv.

oscillate and are deeply striated ; *a* (018) is doubtfully present as striated, slightly irregular planes giving poor reflections.

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′	°	′	′		°	′
c	001	—		—		—		—		—		—	
a	100	90	0	90	0	90	0	90	0	0		0	
m	110	51	57	89	59	51	51	,,		6		1	
a?	018	—		10	14	0	0	9	9	—		1	5
o	011	0	1	52	11	,,		52	12	1		1	
d	102	89	57	39	24	90	0	39	23	3		1	
z	111	51	54	64	25	51	51	64	24	3		1	
	122	32	31	56	49	32	29	56	48	2		1	

Montalbion, Walsh and Tinaroo District, Queensland.

(Plate lxxx., fig. 2.)

The occurrence of anglesite at the Montalbion mines has been noticed by Skertchly.[5] One specimen in which crystals of clear, colourless anglesite are seated on sandstone is in our collection. The habit is fairly uniform, the best developed forms being *m* (110) and *d* (102) ; *c* (001) and *d* are striated parallel to their intersections, but the reflections are generally good.

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′		′	′		′	
c	001	—		—		—		—		—		—	
b	010	0	2	90	0	0	0	90	0	2		0	
m	110	51	52	90	0	51	51	,,		1		0	
o	011	0	2	52	9	0	0	52	12	2		3	
d	102	90	0	39	22	90	0	39	23	0		1	
z	111	51	52	64	22	51	51	64	24	1		2	
r	112	51	53	46	13	,,		46	14	2		1	
p	324	62	21	54	15	62	22	54	16	1		1	

[5]Skertchly—Geol. Survey Q'land, Publication No. 119, 1897, pp. 29, 30.

AZURITE.

Muldiva, Walsh and Tinaroo District, Queensland.

(Plate lxxx., fig. 3.)

This occurrence of azurite has been known for many years,[6] but its crystallography has not been investigated. A specimen, probably from the Paisley Mine, was recently secured by exchange with the Geological Survey of Queensland; it consists of numerous good crystals measuring up to about ·5 × 1·5 × 1 cm. accompanied by small crystals of cerussite on a matrix of limonite. The crystals are constant in habit; elongated parallel to the *b* axis, *a* (100), *m* (110) and *θ* ($\bar{1}$01) having the largest faces. The dome faces are striated parallel to their edges. Five crystals were measured. Combinations are tabulated below.

Cryst.	*c*	*a*	*m*	*w*	*l*	*f*	*p*	*σ*	*θ*	*η*	*v*	*h*	*k*	*o*
i.-ii.	*c*	*a*	*m*	*w*	*l*	*f*	*p*	*σ*		*η*	*v*	*h*	*k*	*o*
iii.	*c*	*a*	*m*	*w*	*l*	*f*	*p*	*σ*	*θ*	*η*	—	—	*k*	*o*
iv.	*c*	*a*	*m*	*w*	*l*	*f*	*p*	*σ*	*θ*	—	—	—	*k*	*o*
v.	*c*	*a*	*m*	—	*l*	*f*	*p*	*σ*	*θ*	*η*	*v*	*h*	*k*	*o*

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.	
		ϕ		*ρ*		*ϕ*		*ρ*		*ϕ*	*ρ*
		°	′	°	′	°	′	°	′	′	′
c	001	90	0	2	24	90	0	2	24	0	0
a	100	89	57	89	59		,,	90	0	3	1
m	110	49	25	89	59	49	39		,,	14	1
w	120	30	18	89	59	30	29		,,	11	1
l	023	4	0	30	45	4	5	30	28	5	17
f	011	2	48	41	37	2	43	41	23	5	14
p	021	1	27	60	32	1	22	60	25	5	7
σ	101	90	0	47	2	90	0	47	10	0	8
θ	$\bar{1}$01	$\overline{90}$	1	44	46	$\overline{90}$	0	44	51	1	5
η	$\bar{3}$02	$\overline{90}$	1	56	53		,,	56	32	1	21
v	$\bar{2}$01	$\overline{90}$	1	63	49		,,	63	47	1	2
h	$\bar{2}$21	$\overline{50}$	2	70	16	$\overline{50}$	13	70	2	11	14
k	$\bar{2}\bar{2}$1	$\overline{48}$	51	69	38	$\overline{49}$	4	69	36	13	2
o	$\bar{2}$41	$\overline{30}$	2	76	16	$\overline{29}$	58	76	11	4	5

[6] Skertchly—*Loc. cit.* p. 36.

Girofla Mine, Chillagoe, Queensland.

(Plate lxxx., figs. 4, 5.)

This occurrence is represented in the Museum Collection by an exceedingly fine specimen of crystallised azurite associated with malachite and chalcocite. The azurite is of two generations, the earlier consisting of long prismatic crystals (to $10 \times 2{\cdot}5 \times 1{\cdot}5$ cm.) of a deep velvety-blue colour and almost iridescent. The azurite is partly changed to malachite, which forms embedded patches of a vivid green; the later generation of smaller, better developed crystals implanted on the older azurite and in cavities is unaltered and well adapted for goniometric determination. The whole forms an extremely beautiful object.

Four crystals were measured; they are tabular on μ ($\bar{1}05$) and elongated parallel to the b axis. The largest faces are those of a (100), m (110) and μ; the base and the orthodome faces are strongly striated, as shown in the figures, and their signals overlap slightly. The following combinations were observed (iv. is figured).

Cryst.	c	a	m	p	σ	μ	n	θ	η	h	Q	o	e
i.	c	a	m	p	σ	μ	n	θ	η	—	—	—	—
ii.	c	a	m	p	σ	μ	n	θ	η	h	Q	—	—
iii.	c	a	m	—	σ	μ	n	θ	η	h	Q	—	—
iv.	c	a	m	p	σ	μ	n	θ	η	h	Q	o	e

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	
c	001	89	56	2	14	90	0	2	24	4	10
a	100	89	59	89	58		,,	90	0	1	2
m	110	49	26	89	58	49	39		,,	13	2
p	021	1	19	60	24	1	22	60	25	3	1
σ	101	89	59	47	1	90	0	47	10	1	9
μ	$\bar{1}05$	$\overline{90}$	10	10	11	$\overline{90}$	0	9	23	10	48
n	$\bar{1}02$	$\overline{90}$	9	25	27		,,	25	28	9	1
θ	$\bar{1}01$	$\overline{90}$	1	44	51		,,	44	51	1	0
η	$\bar{3}02$	$\overline{90}$	2	56	41		,,	56	32	2	9
h	221	49	58	69	57	50	13	70	2	15	5
Q	223	50	59	43	3	51	19	43	12	20	9
o	$\bar{2}41$	$\overline{29}$	53	76	17	$\overline{29}$	58	76	11	5	6
e	$\bar{2}45$	$\overline{27}$	50	38	34	$\overline{27}$	53	38	33	3	1

PHOSGENITE.

Broken Hill, N. S. Wales.

(Plate lxxxi., figs. 1, 2.)

The description is founded on a hand specimen of $6 \times 5\frac{1}{2}$ cm. almost entirely composed of stout prismatic crystals colourless and nearly transparent. The figured crystal is a fragment of $8 \times 4 \times 4$ mm., terminated below by the basal cleavage. The largest faces are *c* (001), *m* (110) and *a* (100), but the development is very irregular. The faces are in general somewhat etched, but the reflections are good. The *m* prism is slightly striated in the vertical direction.

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
c	001	—		—		—		—		—	—
a	100	0	6	90	0	0	0	90	0	6	0
m	110	45	0	90	0	45	0	,,		0	0
u	120	26	30	89	59	26	34	,,		4	1
o	201	0	8	65	23	0	0	65	20	8	3
x	111	45	4	56	57	45	0	57	0	4	3
w	221	45	3	72	2	,,		72	0	3	2
s	211	26	19	67	37	26	34	67	40	15	3

MONAZITE.

Trundle, near Condobolin, N. S. Wales.

(Plate lxxxi., figs. 3, 4.)

We are indebted to Mr. Charles Bogenrieder for the loan of a collection of isolated crystals, the largest measuring approximately 3 cm. in greatest diameter. The colour is reddish-brown, the lustre good, but the faces in general are imperfect, being wavy and irregular In habit they are tabular on *a* (100) ; *v* ($\bar{1}11$) is a fairly large form. A probable new form, *ρ* ($\bar{1}03$) is present as a rather large face, which, however, is wavy and gives only an approximate measurement. The pinacoid *a* is slightly striated

vertically. Three crystals were measured; the figures show a typical, partly idealised crystal with all the recognised forms except *g*.

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′	°	′	′		°	′
c	001	90	2	13	53	90	0	13	40	2		13	
a	100	90	7	90	0	,,		90	0	7		0	
m	110	46	40	90	1	46	43	,,		3		1	
n	120	28	9	90	3	27	58	,,		10		3	
g	012	28	1	27	54	27	43	27	36	18		18	
e	011	14	28	43	40	14	43	43	44	15		14	
u	021	7	21	61	41	7	29	61	49	8		8	
x	$\bar{1}01$	$\bar{9}0$	3	36	14	$\bar{9}0$	0	36	29	3		15	
*ρ	$\bar{1}03$	—		3	36	,,		4	50	—		1	14
v	$\bar{1}11$	$\bar{3}\bar{8}$	44	49	35	$\bar{3}\bar{8}$	37	49	50	7		15	
d	$\bar{1}12$	$\bar{2}\bar{8}$	43	27	40	$\bar{2}\bar{8}$	12	27	42	31		2	

California Creek, Mt. Garnet, Queensland.

(Plate lxxxi., fig. 5.)

This crystal, kindly lent by the Director of the National Museum, Melbourne, measures 1 × 3 × 2 5 cm. in the directions of the axes *a*, *b*, *c* respectively. It is brown in colour and is attached to a matrix of quartz and decomposed mica. In habit it is tabular on *a* (100); the faces are dull, and, for determination, pieces of cover-glass were attached; thus the angles obtained are approximate only. The probable new forms, ρ ($\bar{1}03$) and σ ($\bar{3}01$) were determined by the following measurements with contact goniometer:—

$$a' \wedge \sigma = 20°, \text{ calc. } 20° 17'.$$

$$a \wedge \rho = 94\tfrac{1}{2}°, \text{ calc. } 94° 50'.$$

In all ten forms are present, namely:—*c* (001), *a* (100), *m* (110), *l* (210), *x* ($\bar{1}01$), ρ ($\bar{1}03$), σ ($\bar{3}01$), *v* ($\bar{1}11$), *i* ($\bar{2}11$), *z* ($\bar{3}11$).

CERUSSITE.

Tolwong Mine, near Marulan, N. S. Wales.

(Plate lxxxi., fig. 6.)

The hand specimen consists of stout prismatic cerussite elongated parallel to the *a* axis, accompanied by galena, siderite, and pyrite. The cerussite is coated with galena so that the crystals are quite dark and opaque; they preserve their polish, however, and reflect well.

MEAN ANGLES.

Forms.		Measured.				Calculated.				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
b	010	0	0	90	0	0	0	90	0	0	0
m	110	58	37	90	0	58	37	,,		0	0
x	012	0	0	19	50	0	0	19	52	0	2
k	011	0	1	35	59	,,		35	52	1	7
i	021	0	2	55	21	,,		55	20	2	1
v	031	0	3	65	11	,,		65	15	3	4
p	111	58	38	54	17	58	37	54	14	1	3

EXPLANATION OF PLATE LXXIX.

Topaz.

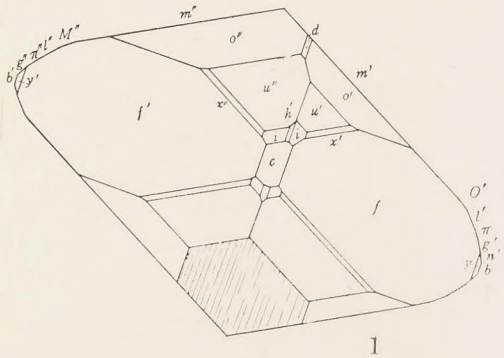
Figs. 1, 2. Carpet Snake Creek, near Torrington, N. S. Wales; orthographic and clinographic projection.

Forms.—*c* (001), *b* (010), *m* (110), *O* (560), *M* (230), *l* (120), π (250), *g* (130), *n* (140), *f* (021), *y* (041), *h* (203), *d* (201), *i* (223), *u* (111), *o* (221), *x* (243).

Gypsum.

Fig. 3. Mt. Elliott Mine, Chillagoe, Queensland; twinned on *a* (100). Orthographic projection on (010).

Forms.—*b* (010), *m* (110), δ (350).



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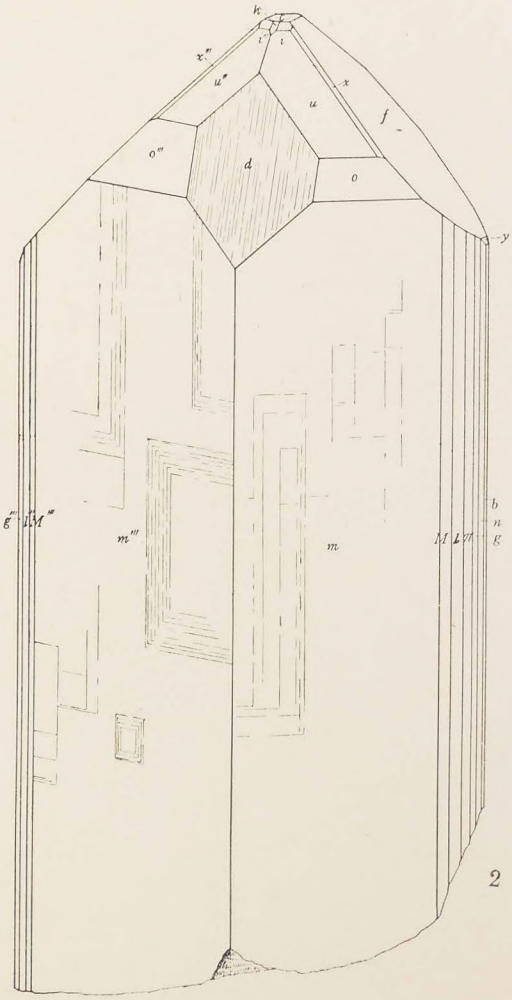

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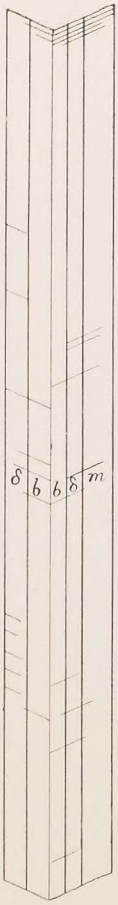

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C. ANDERSON, del,
Austr. Mus.

EXPLANATION OF PLATE LXXX.

Anglesite.

Fig. 1. Proprietary Mine, Broken Hill, N. S. Wales.

Fig. 2. Montalbion, Queensland.

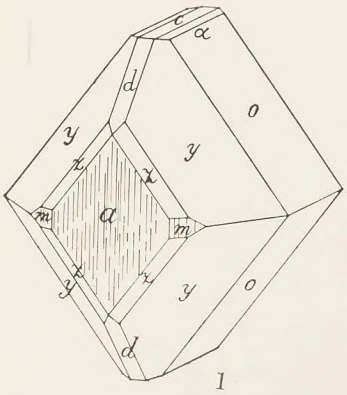
Forms.—*c* (001), *b* (010), *a* (100), *a* (018), *o* (011), *d* (102), *z* (111), *r* (112), *p* (324), *y* (122).

Azurite.

Fig. 3. Muldiva, Queensland. Orthographic projection on (010).

Figs. 4, 5. Girofla Mine, Chillagoe, Queensland. Orthographic and clinographic projection.

Forms.—*c* (001), *a* (100), *m* (110), *w* (120), *l* (023), *f* (011), *p* (021), *σ* (101), *μ* ($\bar{1}05$), *n* (102), *θ* ($\bar{1}01$), *η* ($\bar{3}02$), *v* ($\bar{2}01$), *h* (221), *Q* (223), *k* ($\bar{2}21$), *o* ($\bar{2}41$).



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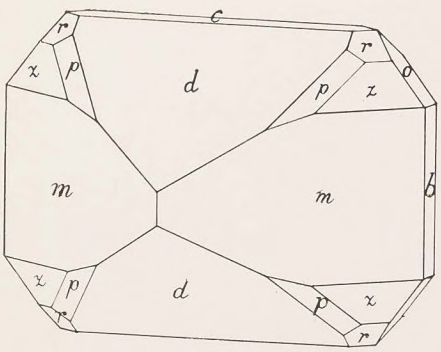

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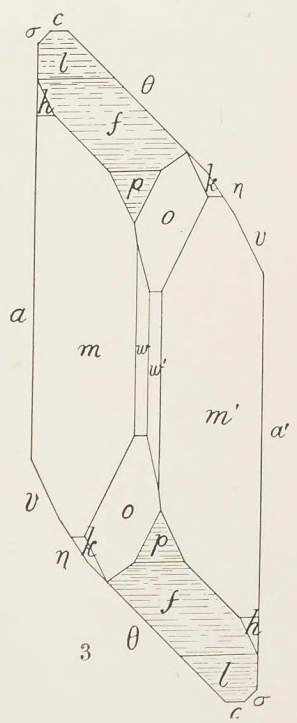

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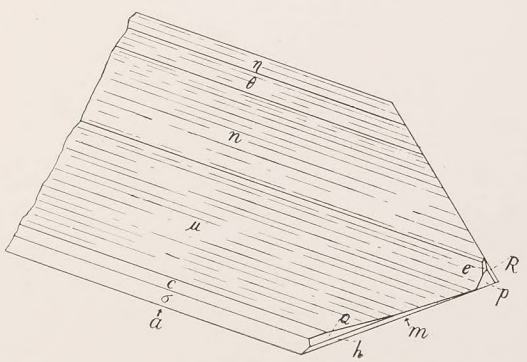
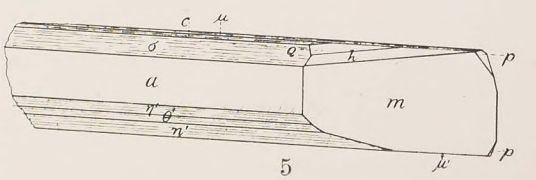


4



5

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EXPLANATION OF PLATE LXXXI.

PHOSGENITE.

Figs. 1, 2. Broken Hill, N. S. Wales. Orthographic and clinographic projection.

Forms.—*c* (001), *a* (100), *m* (110), *u* (210), *o* (201), *x* (111), *w* (221), *s* (211).

MONAZITE.

Figs. 3, 4. Trundle, N. S. Wales. Orthographic and clinographic projection.

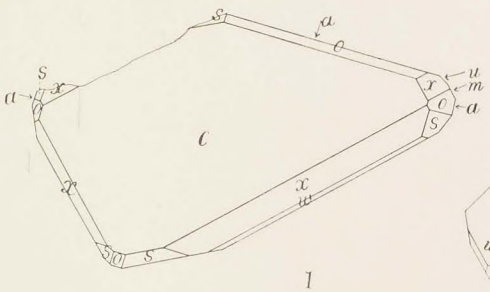
Fig. 5. California Creek, Queensland.

Forms.—*c* (001), *a* (100), *m* (110), *n* (120), *l* (210), *g* (012), *e* (011), *u* (021), *x* ($\bar{1}$01), *ρ* ($\bar{1}$03), *σ* ($\bar{3}$01), *v* ($\bar{1}$11), *d* ($\bar{1}$12), *i* ($\bar{2}$11), *z* ($\bar{3}$11).

CERUSSITE.

Fig. 6. Talwong Mine, near Marulan, N. S. Wales.

Forms.—*b* (010), *m* (110), *x* (012), *k* (011), *i* (021), *v* (031), *p* (111).



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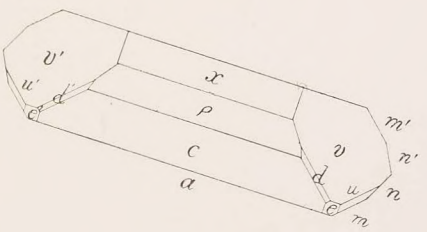

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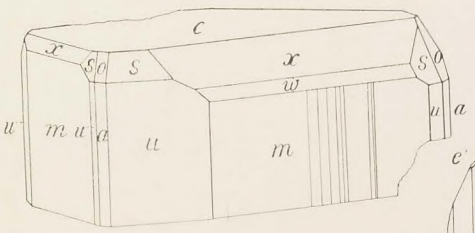

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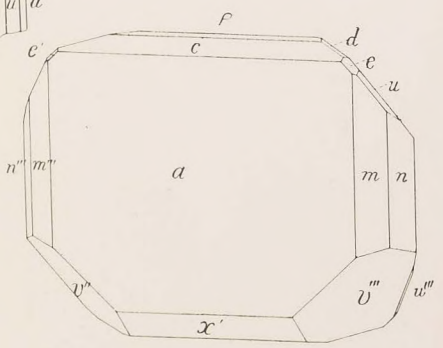

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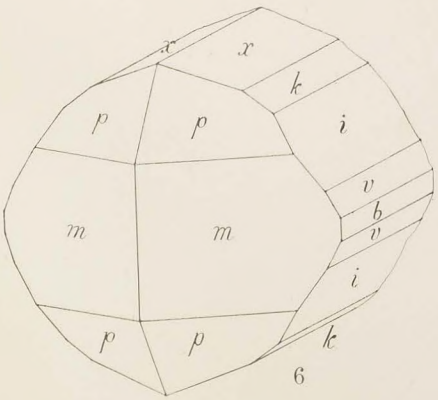

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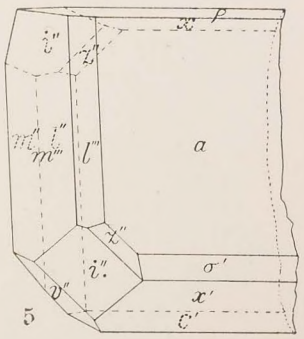

5

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